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MEMORANDUM

SUBJECT: Tier II Estimated Environmental Concentrations for Oxamyl

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This memo presents the Tier II surface water and groundwater Estimated Environmental Concentrations (EECs) for Oxamyl. These values were determined using computer modeling and existing monitoring data. The surface water EEC acute value for use in human health is **1.0 ppb**, and the chronic value is **0.3 ppb**. For groundwater the acute EEC value is **5 ppb**, and the chronic value is **1 ppb**.

Background:

Based on chemical properties, existing monitoring data, and computer simulation, estimates of oxamyl contamination of drinking water supplies resulting from normal agricultural practices have been determined. For drinking water originating in surface water bodies an acute concentration of 1 µg/L should be used to evaluate risk to human health. This value is slightly higher than concentrations reported monitoring studies but significantly lower than PRZM/EXAMS simulation results. Because of the transient nature of the compound in the environment concentrations at levels predicted by modeling (30 µg/L) may occur but will generally not persist. Without spatially and temporally targeted monitoring peak values will not be sampled. A value of 1 µg/L represents an upper bound on potential peak concentrations of oxamyl that can be expected in drinking water. For chronic health risk evaluation 0.3 µg/L

should be used. This value is based on the 1-in-10-year average annual concentration calculated using PRZM/EXAMS, and is in accordance with observed in monitoring data.

For drinking water derived from groundwater the acute EEC value of 5 ppb is based on typical maximum values observed in non-targeted and PGW monitoring studies. Although higher groundwater concentrations have been reported in some monitoring studies these are not typical, and probably represent extremely vulnerable areas. For evaluating chronic exposure a value of 1 ppb should be used. This is a fairly conservative value based on typical concentrations observed in monitoring studies where the parent compound was detected.

Monitoring Data:

Oxamyl is generally not found at high concentration levels in surface water monitoring samples. In the U.S.G.S. National Assessment of Water Quality study Oxamyl was detected in surface water in only one sample out of about 5200 where it was analyzed for it. The reported concentration value was 0.07 µg/L. The STORET database has 14 reported detections of oxamyl in surface water with concentrations ranging from 0.07 to 0.7 ppb and a mean of 0.23 ppb. These values may be representative of environmental concentrations. However, these values are not from targeted studies. Because oxamyl degraded fairly rapidly actual peak concentrations are not sampled. Instead modeled maximum concentration were used to estimate true maximum values.

Groundwater

Available evidence from valid scientific studies submitted to EPA show oxamyl has the potential to leach to ground water. As a result of normal agricultural use, detections of oxamyl residues in ground water wells have been reported in NY, NJ, RI, and MA, with levels as high as 395 µg/l in ground water (Jacoby et al, 1992). As reported in the U.S. E.P.A. Pesticides in Groundwater Database 907 detections out of 23305 well samples were reported between 1971 and 1991. Oxamyl was detected at concentrations ranging from 0.01 to 395 µg/l in 907 of 23,305 well water samples from 10 states (Jacoby et al., 1992, EPA 1990 and EPA 1992). The majority of detections were in Suffolk County (Long Island), New York with 894 detections in 20955 samples with 3 detections above 2 ppb. Only three of the 894 wells sampled in the county had any detections above 70 µg/l, and the maximum concentration reported was 395 ppb. Five detections ranging from 1.0-2.0 were reported from 757 samples in RI. One detection at 1.4 ppb was reported from NJ out of 90 well samples. One detection at 0.1 ppb was reported out of 138 samples in MA.

Oxamyl was detected at concentrations of 5.0 to 5.4 µg/l in three shallow wells (9 to 12 feet deep) installed within 10 feet of a potato field on Long Island, NY. The detections occurred on July 24, 1981, after total applications of 6 and 9 lb ai/acre in 1980 and 1981. No oxamyl residues were detected in the wells (limit of detection of <5 ppb) in subsequent sampling between August and December, 1981. No oxamyl residues were detected in 8 other existing wells located within 30 to 400 feet of potato fields treated at yearly rates of 3 to 11 lb ai/acre (Acc. No. 96623).

In smaller scale, non targeted monitoring studies in the New Jersey coastal plain (Louis and Vowinkel, 1989), North Carolina (Wade *et al.* 1997) and Mississippi (Mississippi Department of Environmental Quality (1995) oxamyl was not detected in groundwater or was detected very infrequently at low levels. While these and other studies do not show major groundwater contamination they are not designed specifically to monitor oxamyl in high use areas. This, along with less than perfect analytical methodology, suggest that care must be taken in evaluating these monitoring results.

Prospective Groundwater Monitoring Studies:

In order to evaluate the potential impact of oxamyl use on ground water, and to determine how persistent oxamyl and its degradates will be in subsurface environments, EPA requested that Small Scale Prospective Groundwater (PGW) Monitoring Studies be conducted. In an on-going Prospective Groundwater Monitoring Study in North Carolina parent oxamyl was detected in groundwater in concentrations up to about 4 ppb (Hiscock and Warren, 1999). Generally the concentration was below 1 ppb. The oxmine degradate was detected at concentrations up to 4.5 ppb and concentrations of 1-2 ppb were common for several hundred days. The degradate appeared to be significantly more persistent than the parent.

Modeling:

PRZM/EXAMS modeling was used to estimate the surface water EEC values for oxamyl resulting from use on apples, carrots and cotton. Soil, cropping and management inputs to PRZM were obtained from local agricultural personal or selected by the PIC (PRZM Input Collator) data base. EXAMS environment inputs are taken from the Georgia pond scenario. Input parameters used in the simulation are shown in Table 2, and model results are shown in Table 1.

One site/scenario was used to represent use of oxamyl on non-bearing apple trees. It represents a 10 hectare field draining into a 1 hectare pond, 2 meters deep with no outlet. Inflow to the pond from runoff are assumed to be exactly balanced by losses due to evaporation and seepage. On the site it is assumed that grass covers the surface below the trees and that applied pesticide lands either on the trees or the grass below.

The site is an orchard/vineyard in Columbia County, New York in MLRA 144B. The soil at the site is a Cabot silt loam. Data for this soil was taken from the PIC database and the 1987 National Resources Inventory. Cabot silt loam is hydrologic group D soil and SCS curve numbers were generated based on this grouping and the plant cover. A total of 3070 acres of apples, about 0.5% of the U.S. total, were grown in Columbia County in 1997 (USDA, NASS, Ag. Census). Weather data was taken from weather station W04725 in Albany, NY. The weather data file is part of the PRZM program and is used to represent the weather for MLRA R-144B. This site receives an annual average precipitation of about 93 cm of which 19% on the average leaves site as runoff. Information on pesticide use and application timing was provided by Richard Struob, Cornell University, Hudson Valley Laboratory, Highland, NY. The site was

selected to represent orchards and vineyards in the eastern United States that are likely to present high exposure to aquatic organisms.

To estimate runoff from oxamyl use on cotton a simulation using 4 application at 6 day interval on a field in Yazoo County, Mississippi was used. The field is in the Loring silt loam soil, a fine-silty, mixed, mesic Thermic Typic Fragiudalf, in MLRA O-134. The Loring silt loam is a moderately well drained soil with a fragipan formed in loess on level to strongly sloping upland and stream terraces on slopes of 0-20 percent. The Loring silt loam is a Hydrologic Group C soil with SCS curve numbers that were measured on a real field in Yazoo County, Mississippi under cotton culture. There are approximately 101,000 acres of cotton grown in Yazoo County, which is the most of any county in Mississippi and among the top 10 percent in the U.S. (US Department of Commerce, 1994a). USLE C Factors were developed by George Foster at the University of Mississippi in consultation with Ronald Parker of the US EPA to represent a cotton field with one year tilled followed by two years under conservation tillage using RUSLE. The weather data is from weather station W03940 in Jackson, Mississippi. The weather data file is also part of the PIRANHA shell and is used to represent the weather for MLRA 131. This weather data was used rather than the MLRA 140 weather data as it was expected to better represent the weather in Yazoo County.

A similar scenario was used to model oxamyl use on carrots. Oxamyl is registered for use on carrots in all states except for California. According to the 1997 Ag Census 49579 acres of carrots were planted outside of California. According to the current Vydate L label oxamyl can be applied to carrots as a single application at 8 lb a.i./per acre. For the carrot scenario the site used in the simulation was a field in Oceana or Newaygo counties in Michigan. These two counties represent about 4 % of the acres of carrots grown in the U.S. outside of California. The soil unit used in the simulation was the Perrington loam in MLRA 96. Data for this soil was taken from the PIC database and the 1987 National Resources Inventory. The Perrington loam is hydrologic group C soil and SCS curve numbers were generated based on this grouping and the plant cover. Cropping practice and pesticide application information was provided by the Michigan State Extension Service office in Freemont, Michigan.

Table 1. Estimated environmental concentrations (drinking water) for Oxamyl on apples (NY), carrots (MI) and cotton (MS) calculated using PRZM/EXAMS

Crop	1 in 10 Year Maximum Surface Concentration	1 in 10 year Average Surface Concentration Values
Apples	30.8 µg/L	0.28 µg/L
Carrots	24.9 µg/L	0.08 µg/L
Cotton	28.3 µg/L	0.26 µg/L

Environmental Fate Input Values

Table 2. PRZM/EXAMS environmental fate input parameters for Oxamyl.

Parameter	Value	Data source
Molecular Weight	219	
Solubility	2.8×10^5	
Vapor Pressure (torr)	3.8×10^{-7}	
Henry's Law Constant	2.38×10^{-7}	
pH 5 Hydrolysis Half-life (days)	stable	MRID 40605-16(c), ACC No. 40494 (s)
pH 7 Hydrolysis Half-life (days)	8 days	MRID 40605-16(c), ACC No. 40494 (s)
pH 9 Hydrolysis Half-life (days)	3 hours	MRID 40605-16(c), ACC No. 40494 (s)
Soil Photolysis Half-life (days)	stable	Acc. No. 147704
Aquatic Photolysis Half-life (days)	11 days	MRID 406065-15 Acc. No. 40494
Aerobic Soil Metabolism Half-life	20 days	MRID 428200-01 (c), 413462-01 (s), Acc. No. 63012 (c), 40494 (s), 154748 (s)
Aerobic Aquatic Metabolism Half-life	stable	No data available
Anaerobic Soil Metabolism Half-life	7 days	MRID 428200-01 (c), 413462-01 (s), Acc. No. 4094 (s), 113366 (s)
Soil-Water Partitioning Coefficient K_d (K_{oc})	0.02 L/kg (6 L/kg)	Acc. No.154748 (s), 40494 (s)
Application Rate	8 lb a.i./acre (carrots) 2 lb a.i./ acre (non-bearing fruit) 1 lb a.i./acre (cotton)	Vydate® L Label
Maximum Application Per Year	8 lb a.i./acre (carrots) 8 lb a.i./ acre (non-bearing fruit) 1 lb a.i./acre (cotton)	Vydate® L Label

References

Jacoby, H., C. Hoheisel, J. Karrie, S. Lees, L. Davies-Hilliard, P. Hannon, R. Bingham, E. Behl, D. Wells, and E. Waldman. 1992. Pesticides in Ground Water Database - A Compilation of Monitoring Studies: 1971-1991, EPA 734-12-92-001, September 1992.

Hiscock, A.M., and R.L. Warren, 1999. A Small Scale Prospective Ground-Water Monitoring Study for Oxamyl, Interim Report 2 - Cumulative Monitoring Results Through 376 Days After Treatment. January 4, 1999. MRID # 447483-01.

Louis, J.B., and E. Vowinkel. 1989. Effect of agricultural chemicals on ground-water quality in the New Jersey coastal plain. In: Pesticides in terrestrial and aquatic environments: Proceedings of a national research conference May 11-12, 1989. Virginia Polytechnic Institute: Richmond, VA.

Mississippi Department of Environmental Quality. 1995. Analytical results and activities of Mississippi agricultural chemical groundwater monitoring program: Second report, March 1, 1989 to March 31, 1995. MDEQ, Office of Pollution Control. 42 pp.

United States Environmental Protection Agency. 1990. National Survey of Pesticides in Drinking Water Wells Phase I Report. Office of Water and Office of Pesticides and Toxic Substances, Envir. Prot. Agency, Washington, DC. EPA 570/9-90-015.

United States Environmental Protection Agency. 1992. Another Look: National Survey of Pesticides in Drinking Water Wells Phase II Report. Office of Water and Office of Pesticides and Toxic Substances, Envir. Prot. Agency, Washington, DC. EPA 579/09-91-020.

Wade, H., C. Bailey, J. Padmore, K. Rudo, B. Williams and A. York, 1997. *The interagency study of the impact of pesticide use on ground water in North Carolina*. North Carolina Dept. of Ag. 2109 Blue Ridge Rd., Raleigh, NC. 112p